The international debate on Electromyography of Scalene and Rectus Abdominis during the respiratory cycle in healthy subjects

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Objective: Expose the electromyography and spirometry relationship and establish the chronology of the contraction of Scalene and Rectus abdominis which works together in synergy antagonism in physiological breathing.

Methods: 128 electromyographic tests were performed during the respiratory cycle on 43 healthy adults. EMG signals of Scalene, Rectus abdominis were recorded. The breathing was recorded by using a spirometer (vernier®).

Results: The duration of the contraction of Scalene are superior to Rectus abdominis 82% p-value = 0.000058, the amplitude of Scalene is superior of Rectus abdominis, p-value = 0.000000073. 109 tests of Scalene contraction begin before that of Rectus abdominis (63.74%), p-value = 0.000012. RMS is 0.02 ± 0.011 μv for Rectus abdominis and 0.04 ± 0.021 μv for Scalene, p-value = 6.76591E-06. Duration of inspiration is 1.25 s ± 0.19, the expiration is 1.04 s ± 0.19. The mean frequency of Rectus abdominis is 54.19 Hz ± 6.35, it is 57.21 Hz ± 7.08 for Scalene, p-value is 9.84081E-08. The median frequency of Rectus abdominis is 51.05 Hz ± 6.51, it is 52.72 Hz ± 6.94 for Scalene, p-value is 0.0098. The muscle fatigue of Rectus abdominis decreased from 60.40 ± 0.45 to 19.98 ± 4.32. For Scalene it decreased from 60.41 ± 0.4 to 23.52 ± 4.41.

Discussion: There is a synergistic - antagonism relationship between Scalene and Rectus abdominis during respiration. Scalene is a main inspiratory muscle, its contraction is important in amplitude, duration and frequency. Both muscles are fatigable during the inspiratory cycle.

Note: This work is partly presented at 11th Annual Congress on Pulmonology & Respiratory Medicine | March 18-19, held at Amsterdam, Netherlands.